

Native Forage

A guide to getting the most
from your grazing operation



Josh Marshall



Serving nature and you



Contents

Benefits of Using Native Forage	1
Why Native Warm-Season Grass Beats Cool-Season Grass for Summer Grazing	1
Grazing Systems	3
Haying Native Forage	6
What's in a Native Warm-Season Grass Mix?	7
Establishing Native Forage	8
Ready to Get Started?	Back Cover



Benefits of Using Native Forage

If you're new to the term *native forage*, it simply means a mix of native grasses like big bluestem as well as native legumes and broadleaf plants.

Better Summer Gains

For the producer, one of the greatest benefits of using native forages is increased weight gain among livestock during late spring and throughout summer. Most pastures contain introduced cool-season grasses (CSG), and it is a challenge to keep them actively growing during the summer to maintain livestock weight. Native warm-season grasses (NWSG) grow well during summer, and they will improve average daily gain on stocker cattle by one pound per day compared to tall fescue (Figure 1).

Spring calves on cows will gain 60 to 80 pounds more on NWSG than on CSG by the end of the summer grazing season. Management of the

Animal Grazed	Forage	Summer-Long Average Daily Gain Pounds
Fall stocker cattle	Big bluestem-Indiangrass mixture	1.81-2.12
Fall stocker cattle	Endophyte tall fescue	0.8-1.5

Figure 1: Native warm-season grasses like big bluestem and Indiangrass can put more gain per day on each stocker during the summer than cool-season grass like Kentucky-31 tall fescue. Sources: University of Tennessee – Center for Native Grasslands Management.

grazing system with proper stocking rate and rotation is critical.

Deeper Roots for Better Soil and Water Conservation

Another benefit of grazing natives is improved soil health, which boosts the diversity of plant roots that occupy the space underground. With proper grazing, levels of organic matter have increased in pasture systems.

From a water-conservation standpoint, deep roots and plenty of soil organic matter mean

better water absorption following rain events. And in a state where farmers and ranchers can experience both flood and drought in the same year, native forage can help keep rainwater where it falls. In turn, deep-rooted native forage will stay in good condition longer if drought conditions occur later on.

Fewer Inputs

Using NWSG and forbs in your grazing system could alter the amount of mineral supplement needed, which may lower input costs.

Why Native Warm-Season Grass Beats Cool-Season Grass for Summer Grazing

A plant's biggest source of energy is the sun. Photosynthesis is a process where plants gather sunlight and convert it into plant products, such as stems, leaves, root exudates, etc. NWSG are much more efficient at photosynthesis than CSG. It is important to understand that CSG and NWSG are chemically and physically different. CSG actively grow at cool temperatures during the spring and again in the fall (Figure 2).

Tall fescue, orchardgrass, bluegrass, ryegrass, timothy, and smooth bromegrass need nights

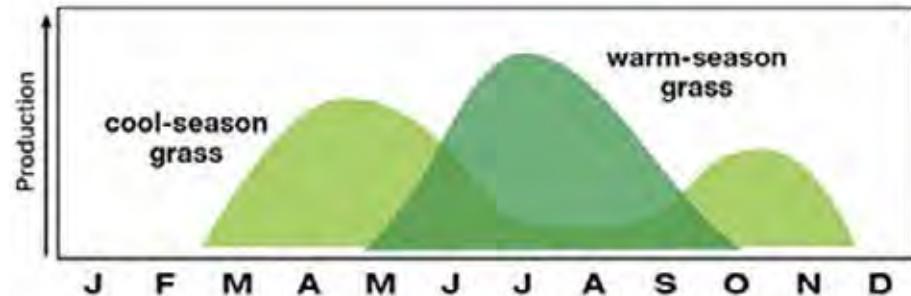


Figure 2: Seasonal production rates of cool- and warm-season grasses. Source: Natural Resources Conservation Service – Kansas.

above 50 degrees F and days below 80. NWSG, such as big bluestem, Indiangrass, switchgrass, or little bluestem, need nights above

60 degrees F and days above 70. NWSG will make optimum production when the temperatures are between 85–95 degrees F.

A Detailed Comparison

Plants grow in response to day length and temperature. CSG are less efficient compared to NWSG with the inputs of water, fertilizer, and sunshine. CSG leaf blades have pores called stoma that open during the day and allow water to leave the plant through transpiration. NWSG also have pores in their leaves, but theirs are closed during the day, and this helps the plants conserve moisture.

CSG root systems are not able to use nutrients as efficiently as our native grasses do. CSG grow in the spring and fall when there is more rainfall and soil moisture, allowing the plant to survive with a smaller root system and less root mass. During the spring and fall, fertilizer is spread on CSG, particularly tall fescue, to get maximum plant growth. NWSG do not require added fertilizer to maintain maximum forage

production. Instead, NWSG roots have developed a relationship with bacteria, fungi, beneficial nematodes, and mites, which allows them to be better adapted to our soils.

This relationship also allows NWSG plants to trade sugars for minerals and water needed in their growth. CSG, particularly tall fescue, do not associate with the soil food web nearly as well. Some types of tall fescue are infected with a toxin-producing endophyte, which has negative impacts on animal production and health, but enhances the persistence of infected tall fescue plants.

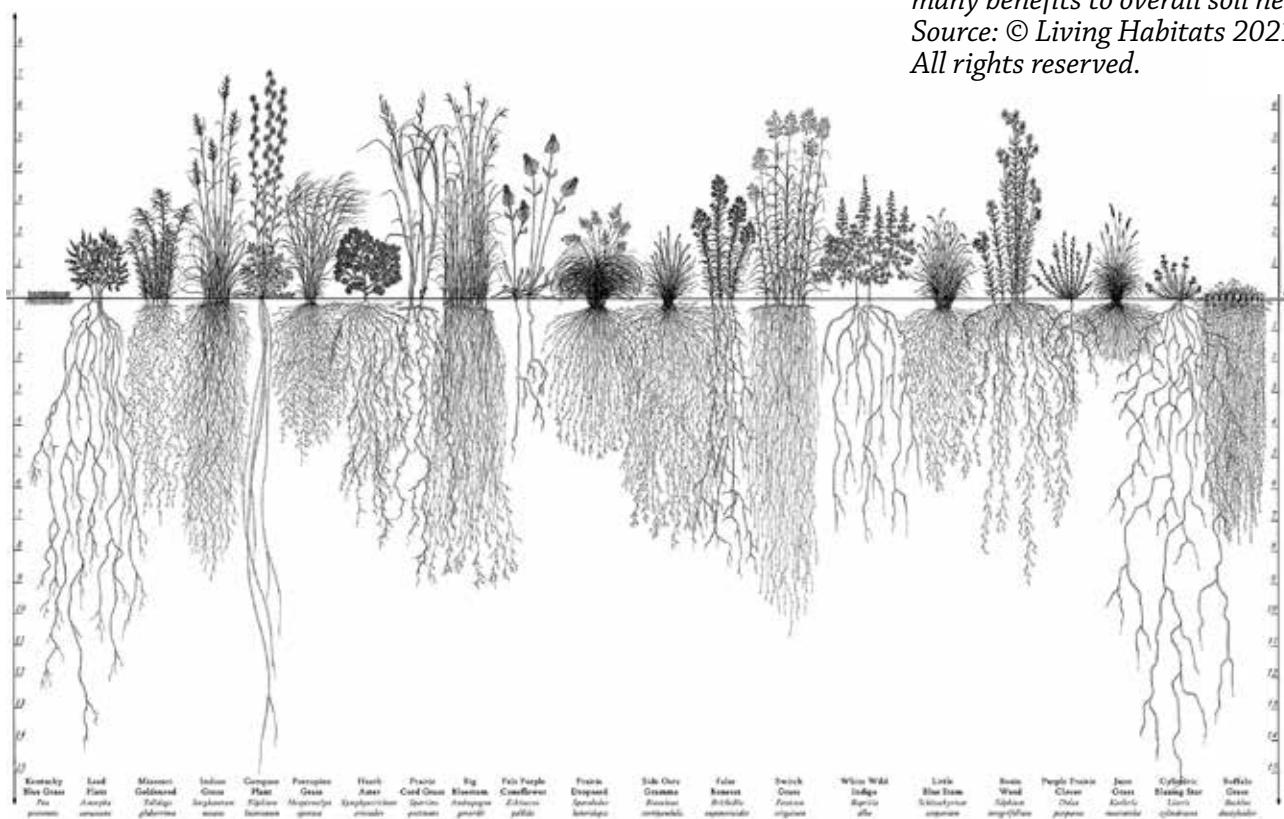
Roots of many native forages grow 6 to 10 feet deep, or more, depending on soil depth (Figure 3).

During the heat of summer, native forages can withstand longer periods of drought compared to the

short-rooted CSG. When NWSG, native legumes like partridge pea, and a variety of other native broadleaf plants are planted together, there will be an enhanced relationship among the intertwined roots that share nutrients.

To aid in this sharing, native forages have mycorrhizal fungi that are found in the roots and create an association between the plants and the soil. The plant's root mass and surface of the roots intertwine, making the mycelium of the fungi an extension of the roots, which helps pull in nutrients and water. Therefore, NWSG do well with limited inputs, such as water and nutrients. Fescue is not able to take advantage of this fungi function.

Figure 3: Native prairie plants have root systems that reach depths far greater than their nonnative, cool-season plant counterparts, providing many benefits to overall soil health.
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Root Systems of Prairie Plants

Grazing Systems

Grazing systems in Missouri have changed over the years to contain mostly CSG, primarily tall fescue. This has made it challenging for producers to manage their pastures throughout the year. By converting acres to NWSG in a CSG grazing system, overall productivity will increase. NWSG will increase the tons of forage and average daily gains that come off that grazing system.

Producers generally will ask how much of the NWSG they need in their CSG grazing system. This will depend on how many months the NWSG will be grazed.

Aim for 25-40 Percent

The acreage of NWSG that should be incorporated into a grazing

system depends on the type of grazing system being used. In most grazing systems, it is best to incorporate 25–40 percent of the acreage to NWSG (Figure 4) with grazing generally beginning in May and continuing through the middle of summer.

If the grazing system already has pastures with adequate water available in each paddock, then it is easier to determine which pastures will be converted from CSG to NWSG. The NWSG pastures will need to be close enough to each other to allow for rotating the livestock from pasture to pasture throughout the summer. If the paddocks and watering systems are not currently established, there may be cost-share opportunities available.

Contact your local Soil and Water District or USDA service station for program availability.

Remember, when NWSG are being grazed during the summer, the CSG are being rested and will be in better condition when the livestock are moved to the CSG for fall grazing beginning in September. In fact, having NWSG as part of the grazing system will allow for more stockpiling of rested tall fescue pasture, which will extend winter grazing.

Simple grazing rotations may be more commonly used by producers because they may only involve moving livestock every few days or a week or more, depending on the forage. These types of grazing systems usually require at least four or more paddocks/pastures. Some producers will graze their native forages using a high-density/short-duration method in small paddocks by rotating animals every few hours for up to a day or two.

Figure 4: It's advised to convert 25–40% of the grazing acreage to NWSG. Source: Pheasants Forever and Quail Forever in Missouri.

NWSG	CSG
CSG	CSG

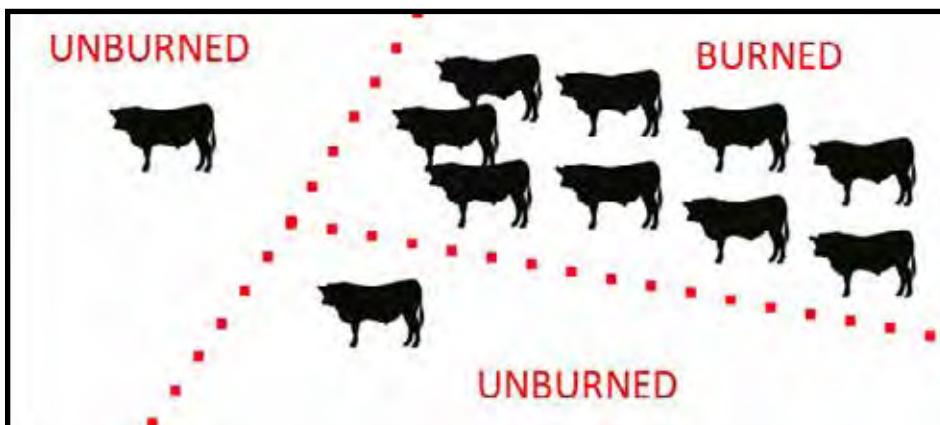


Figure 5: Cattle graze more on the burned portion of the pasture. Source: Pheasants Forever and Quail Forever in Missouri.

Patch-Burn Grazing can Save on Interior Fencing

Native forages work well in a patch-burn grazing system. Patch-burn grazing works best with pastures that are 160 acres or more in size but can work in smaller pastures as small as 40–60 acres. In this method, cattle have access to the whole pasture with no interior fencing. The pasture has three or more burn patches. Before a grazing season begins, a patch is burned. When cattle graze the pasture, they will graze the majority of the time on the recently burned patch with the most palatable forage and spend less time on the unburned patches (Figure 5).

Consider Stocking Rate

No matter which grazing method is used, attention should be given to the number of animals that are grazing (stocking rate).

Stocking rate is the total pounds of grazing animal per acre and usually referred to in animal units (AU). One AU equals 1,000 pounds. For example, an 1,100-pound cow is 1.1 AU, while an 800-pound steer is 0.8 AU. The stocking rate is determined by the type of livestock being grazed, the amount and quality of forage available, and the pasture system that is being managed. Seek advice from your local Natural

Resources Conservation Service office, Missouri Department of Conservation (MDC) private land conservationist, or Quail Forever and Pheasants Forever farm bill wildlife biologist to establish the proper stocking rate for pastures.

Including NWSG as part of a grazing system will require appropriate stocking rate to sustain the forages in pastures. However, as NWSG are incorporated, stocking rates can often be increased over previous rates.

NWSG have the highest protein content early in the grazing season (Figure 6). Protein levels drop

gradually throughout the summer. To use the higher protein, grazing of NWSG forages should begin in May, particularly when grazing stocker cattle.

When grazing native forages, particularly native grasses, the rule of thumb is to take half and leave half of the existing forage. At the end of the grazing season, or by the middle of September, there should be a minimum of 8 inches of forage height left to give the native grasses time to recover before frost. During this period, NWSG replenish nutrients back into the roots used for growth the next spring.

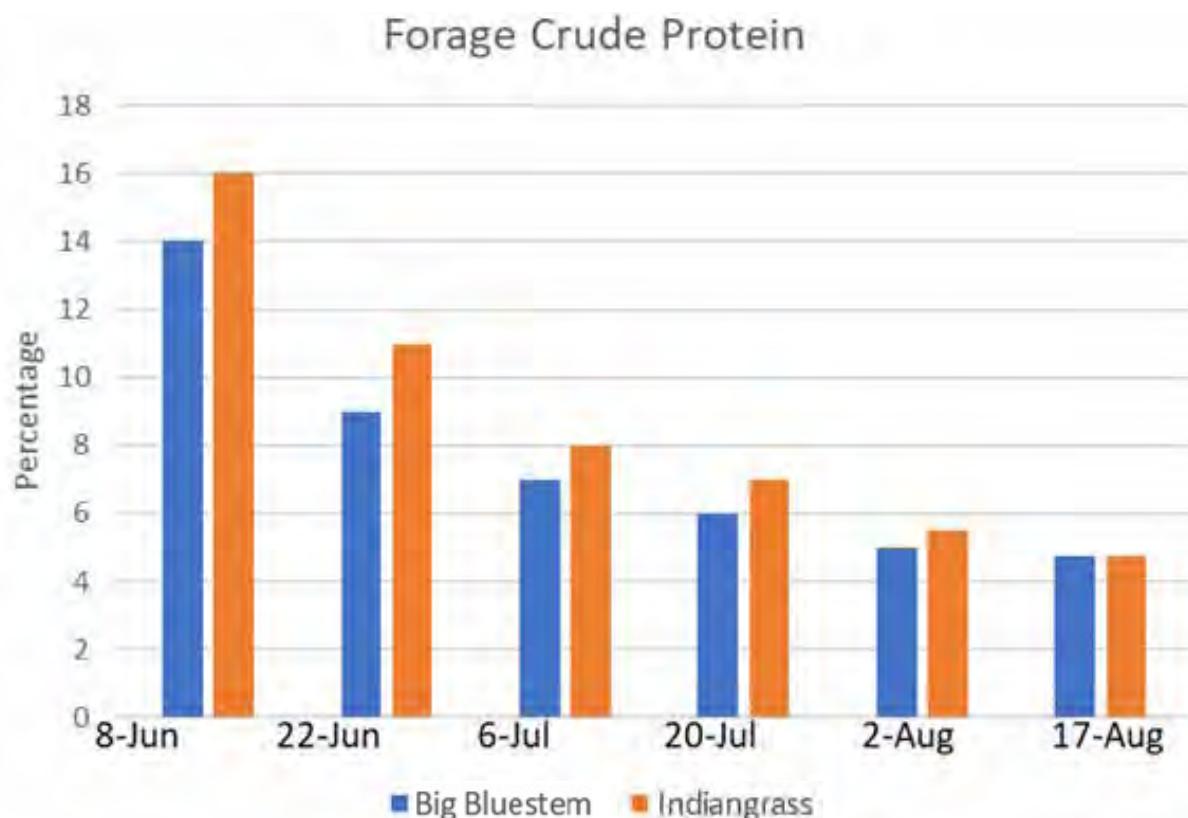


Figure 6: Native grasses such as big bluestem and Indiangrass have highest levels of crude protein early in the summer. Levels gradually drop throughout the growing season as NWSG mature. Source: Perry and Baltensperger, 1979. University of Tennessee PB1752, Chapter 3, Using native warm-season grasses as forage for livestock.

Native forage works for us!



Cliff White

"We haven't had to doctor for much of anything since we got into native grass."

Tanya and Dave Haubein, along with their daughter and son-in-law Ann and Brady Owen, converted nearly half of their operation's forage base to native grasses and forbs.

Dave Haubein and his family raise cattle and row crops on 4,600 acres near Lockwood in southwest Missouri. A dramatic drop in veterinary costs is just one of the many reasons he and his cooperators are sold on the benefits of native forage.

Another is drought resilience.

"We had a flash drought in 2020, and it got pretty rough in certain areas," Haubein said. He took his stockers off fescue and put them on 200 acres of native warm-season grass. "They gained an average of 2 $\frac{3}{4}$ pounds a day."

In addition to reduced vet costs and greater drought resilience, Haubein said that converting nearly half of the operation's forage base to native grasses has improved soil health, increased rainwater

absorption, and made life easier for his animals and his managers.

"If you have proper rotation on your native pastures," he said, "you don't need heavy-duty external fences. The cattle are happy."

A lifelong quail hunter, Haubein was thrilled when he started seeing and hearing more bobwhites on his land. "What we're seeing is we've got really healthy land for wildlife," he said.

To help them make the transition to native forage and other conservation farming practices, Haubein and his family have worked with conservation agencies and nonprofits. "What we're learning is that it takes a lot of cooperation with partners to be where we are on these projects," he said.

He urges other producers to add native forage to their grazing operations. "Reach out to your NRCS service office for help," he said. "These are proven practices that really enhance an operation."



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Haying Native Forage

Most of the prairies remaining in Missouri are hay prairies. Native forages will produce the same high-quality hay that prairies produce. Hay quality will change throughout the summer. Protein level in NWSG is highest at the beginning of the growing season (Figure 6). That protein level drops off by September. The forage quality also drops when NWSG begin putting up seed heads and the forage becomes less palatable because of higher fiber in the seed stalks. Haying in July will produce better quality hay than hay baled in August (Figure 7). Native forages

do not need fertilization when properly grazed, but when the natives are hayed, the phosphorus (P) and potassium (K) may need to be added back to the soil since hay removes those nutrients from the field in each hay bale.

As nutrients are depleted in hay fields, undesirable plants, such as broom grass (broom sedge), will become a dominant vegetation in the hay fields. Soil testing will help you monitor the nutrients within the hay field.

Native forages may be hayed annually, but keep in mind, the nutrients need to be replenished.

Some information indicates NWSG can be hayed twice in the same year. Here again, the hay field will be depleted of nutrients much quicker and weaken the forage stand. Native forages need to be cut for hay 6 inches or more above the ground to help the plants recover sooner. Remember to allow NWSG time to grow at least 45 days prior to frost. This period is important for NWSG to replenish nutrients in roots that are needed for initial growth the next spring. The NWSG should be 12 inches high at frost.

NWSG Production

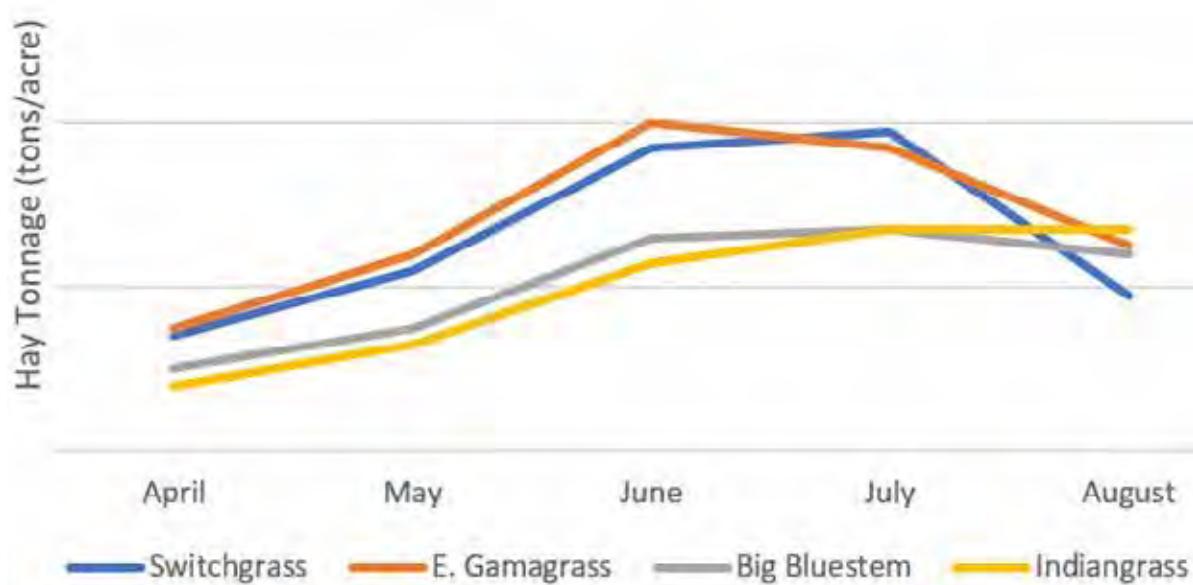


Figure 7: The production of NWSG increases through the summer until the grass matures. Hay tonnage is highest in July. Source: University of Tennessee — Center for Native Grasslands Management, SP 731-D.

What's in a Native Warm-Season Grass Mix?

Many years ago, pastures or hayfields were planted to a single grass. Today a variety of grasses are recommended in each planting. Increased diversity of forage plants within your pastures will help improve the overall productivity. A typical NWSG mix will include big bluestem, Indiangrass, eastern gamagrass, switchgrass, and little bluestem. Other NWSG that may be added include side-oats grama, prairie dropseed, and lovegrass. The mixture of NWSG will depend on the soil types where the grasses are being planted. Some of these grasses do well in deeper soils while other grasses can grow in parts of the field with thin soils. Consultation with an MDC biologist or other professional experienced in native grasses can examine your field and objectives and discuss the various options of what species to plant.

Avoid Planting Nonnative Cool-Season Grasses With Native Forage

If diversity of plants is a good thing, then why not plant CSG with NWSG in the same pasture? There is a physical difference between CSG and NWSG, but it is known that the original prairies had both cool-season and warm-season grasses growing next to each other. Those CSG are native species, such as wild rye, Junegrass, etc.

Today, some producers are adding native CSG to their native forage mixtures (NWSG and forbs) in their pastures to lengthen the grazing season. With proper management, this mixture of all the native forages together seems to work in grazing systems.

Remember, there is a difference between native CSG and nonnative CSG, such as tall fescue, smooth bromegrass, etc. It does not work well to plant NWSG with Kentucky-31 tall fescue. Evidence shows the fescue roots are toxic and have an allelopathic effect that may inhibit the growth of native forages, although research suggests this effect may be minimal. It should be noted that this toxic effect has not been observed in new fescue cultivars, such as novel and nontoxic fescues. Furthermore, NWSG and nonnative CSG have different growth cycles and management needs, which complicates their co-existence.

Once established, native pastures can produce 4–5 tons of high-quality forage during the hottest, driest months of the year.



Josh Marshall

Establishing Native Forage

Native forages are not as difficult to establish as some believe. It is important to know that good management is needed before and after planting them. As with any crops planted on a farm, proper preparation ahead of planting is critical.

Once a native forage planting location is determined, a plan will be needed to lay out each step in preparing the field. The plan will lay out the condition of the field, whether it had been in row-crop or if it's in grass that needs to be converted. Seek advice from someone knowledgeable about establishing native forages. Help is available through the local USDA office, MDC, or Pheasants Forever and Quail Forever.

Forbs add Value

It is also recommended to add native broadleaf plants in with NWSG. Many of the native forb roots are longer than those of NWSG (Figure 3). Therefore, the forbs work well with NWSG because they do not compete. Instead, they share nutrients through the root systems.

Native legumes (members of the pea family) are part of this group. Livestock graze the native legumes and broadleaf plants along with the NWSG. The introduction of forbs in your grazing system increases the available minerals for the livestock, which they could not get by grazing the grasses alone. This will in return lower the amount of mineral supplement needed and lowers the input costs of your grazing operation. Having a variety of native plants in the warm-season pastures is key to the overall function of the grazing system.

Start With a Soil Test

Not all ground on a farm has the same soil condition. There have been instances when a landowner has tried various forages in a pasture or hay field only to experience the same low production with each of the forages. Even though various natives are adapted to thin or poor soil, the production will still be low. Choose fields with better soil that will produce a higher tonnage of native forage.

That's why one of the first steps before establishing native forage is to conduct a soil test on the field. If the soil is brought up to test, it needs to be done six months ahead of planting. The type of soils will help determine what natives are picked to make up the seed mix. Good soil and proper seed mix will greatly improve the success of establishment.

Select Your Seed Mix

Based on prior discussion with a biologist, determine your seed mix and amount needed. As noted earlier, seed mixes may change depending on soils and desired objectives.

Prepare the Seedbed

Herbicides can be used to aid in the establishment of native forage. Both pre- and post-emergent herbicides have been used to kill existing vegetation and to control weedy vegetation while the native seedlings are beginning to grow.

Herbicide treatments are usually done twice before planting the native seed. That is why planning and preparation well ahead of planting is crucial for success. Not all native plant types are tolerant of herbicides. Be sure to read the herbicide label to determine this.

Plant the Seed in the Winter or Early Spring

Native grass and forb seed can be planted together with a farm drill or may be broadcast, depending on the seed mix. Much of the seed may be visible on the ground surface after planting. Planting can occur during dormant season (in winter) or at the beginning of the growing season in the spring.

Don't Plant too Deep

Native forage seeds range in size from very small and light to large and heavy. Some of the seed, particularly some of the native grasses, are fluffy because of the awns/beard attached to the seed. With this variety of seed, it is a challenge to get the seed planted with good seed-to-soil contact. Do not plant the native seed too deep (most less than $\frac{1}{4}$ inch deep).

Firm the Seedbed

Another requirement for a successful establishment is to plant the seed into a firm seedbed. This can be accomplished by planting into an untilled crop field or grass field. If the field is tilled, it needs to be rolled or packed with a farm implement, such as a cultipacker. The firm seedbed will create an even stand of native seedlings. A firm seedbed can make the difference from a poor-fair stand to a good-excellent stand of native forage.

Maintain the Planting

Maintenance of the field after planting is just as important as preparing the field prior to planting.

During the first growing season, native forage seedlings are focusing their energy into root

development and need sunlight to maximize growth. If weeds grow above the native seedlings and shade them, they will not be able to grow deeper roots, thus resulting in weakened plants. This may cause a failed stand and may result in the need to replant or start over.

In some instances, the weeds need to be high-clipped above the native seedlings to allow sunlight to reach them. High-mowing is critical for the seedlings during the first growing season and may need to be done several times depending on the weed pressure. This mowing may also need to be done the second year, depending on weed growth.

Caution: Fertilizer Encourages Weed Growth

Most landowners that plant native forages are disappointed with the short growth during the establishment year. Many also want to know if they need to fertilize. Adding nitrogen (N) fertilizer during establishment encourages weed growth and increases competition and is not recommended. Native pastures do not need added nitrogen during establishment. After establishment, if nitrogen is applied to the NWSG to increase the forage tonnage, apply no more than 40 pounds per acre. It is best to get soil samples of the pasture tested to determine the levels of nutrients available in the soil for the forages.

Native Forage Helps Native Wildlife

If you enjoy seeing bobwhite quail, migrating monarch butterflies, and other pollinators on your land, establishing native forage is a key way to help them survive and thrive.

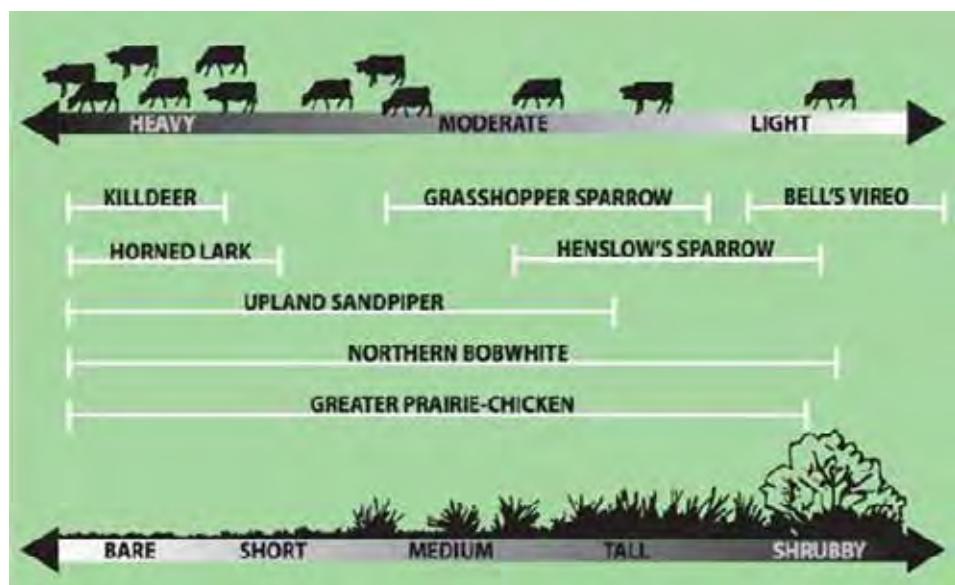


Figure 8: Songbirds and upland birds use different portions of fields within a grazing system depending on grazing intensity. Source: Modified from *Prairie Conservation* by Fritz L. Knopf.

The diversity of plants that native forages provide in a pasture system will provide a diversity of plant height that offers a greater variety of wildlife cover (Figure 8).

For example, some grassland birds require short vegetation for nesting while other birds need taller, more dense vegetation. Native broadleaf plants added to the forage mixture in the pasture will provide better places for birds to raise chicks and find adequate insects for food.

Native grasses mixed with native forbs like milkweeds give butterflies, like the declining monarch, host plants on which to lay their eggs and nectar plants on which to forage.

During the fall and winter, the plant growth left in the pasture by the native forages will provide cover for a variety of wildlife, including a place for deer to bed. This same pasture can also provide

cover for upland game, such as bobwhite quail or cottontail rabbits.

Leave Some Standing Hay for Wildlife

When pastures are mowed in late summer or early fall, quail will leave these pastures because of a lack of cover. Ideally, it would be best to not mow all the pastures at one time, and instead, leave one-quarter to one-third of the pasture unmown each year. Those portions of the pastures that were left idle this year can be mowed the following year. This is one simple way to provide more usable habitat for wildlife in the pasture system.

Ready to Get Started?

For help incorporating native grasses into your operation, reach out to one or more of the following:

Missouri Department of Conservation

mdc.mo.gov/contact-engage/regional-offices

USDA Natural Resources Conservation Service

nrcs.usda.gov/wps/portal/nrcs/mo/contact/local/

University of Missouri Extension

extension.missouri.edu/programs/native-grass-project

Reach **MFA, Inc.**'s native grass grazing specialist at conservation@mfa-inc.com

Quail Forever

missouripqf.org/contact



mdc.mo.gov



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